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THE MAINTENANCE OF SCIENTIFIC RESEARCH¹

BROADLY taken, the apparatus of prosecution of research in this country is made up as follows: (1) Scientific and professional societies and some institutions entirely privately supported; (2) universities and colleges, with their scientific departments; (3) institutions, using that term in the widest sense, directly subventioned by the state, such for instance as the Medical Research Council, the Development Commission, and the Department of Scientific and Industrial Research. Of these three categories, the first named, the scientific societies group, works without financial aid from the state, apart from the small though extremely useful two government grants distributed, mainly to individual workers, through the Royal Society. At the present time many of the societies sorely need financial help to carry on their labors, and some are absolutely at a loss to know how to publish the scientific results that are brought to them. The second category, the universities and colleges, depends in part upon government aid. In the aggregate of twenty-one institutions of university rank, following Vice-Chancellor Adami's figures, students' fees and endowment provide about 63.5 per cent. of the total income; for the rest they are dependent on government grant. The third category, as said, draws state-support direct.

This triple system may seem a somewhat haphazard and incoordinate assembly. Yet in reality it is an organization with much solidarity, and its coordination is becoming more assumed. Its parts dovetail together. The first group, the scientific and professional societies, is provided with a medium of intercommunica-

¹ From the presidential address delivered at the anniversary meeting of the Royal Society and printed in *Nature*.

tion and co-action, the Conjoint Board of Scientific Societies. As to the separate categories composing the triple system itself, they also are in wide touch one with another. Between the scientific and professional societies on one hand and the universities on the other, contact and inter-relation are secured by some degree of free and rightful overlap, both as regards general subject-matter of research and of their *personnel*. Finally, there is excellent contact between both these categories and the third, the state subventioned institutions. A special feature of the policy and administration of these state organizations secures this, a feature which makes the whole of this subject the more cognate to the purview of our own society. To exemplify I may turn, for instance, to the Development Commission. Its program of fishery research, avoiding the terms "pure" research and "applied" research in view of the possible implication that pure research does not lead to practical result, directs research not alone to the solving of particular economic problems. It supports more especially what it terms "free" research, investigation in this case of the fundamental science of the sea and of marine life.

Again, with the Advisory Council of Scientific and Industrial Research, its program, gradually defined during the past six years, is laid down as having four main points: (1) the encouragement of the individual research worker, particularly in pure science; (2) the organization of national industries into cooperative research associations; (3) the direction and co-ordination of research for national purposes; and (4) the aiding of suitable researches undertaken by scientific and professional societies and organizations. It recruits researchers by giving financial opportunity to promising students to be trained in research, attaching them to experienced researchers. In short, it apprentices to research a number of selected younger workers in universities, colleges and other institutions scattered throughout the country.

So, similarly, the Medical Research Council. Its secretary, Sir Walter Fletcher, in an illuminating presidential address to Section I of the British Association meeting this summer, said,

speaking of the nexus between scientific research and the progress of medicine, "It is the accumulating knowledge of the basal laws of life and of the living organism to which alone we can look for the sure establishment either of the study of disease or of the applied sciences of medicine."

It is evident, therefore, that, with a policy based on such principles as these, the third category in the triple system constituting the organization for scientific research in this country is one which has common aim and solid touch with both the others, the universities and the scientific and professional societies. One sees in short that the organization which has come into existence and is maintaining scientific research in this country is a real organization. It did not spring fully equipped from the head of Zeus. It has grown up rather than been planned. In that respect it is an organization essentially British, and it seems qualified to do its work for the country well. We hear of adventures, political and other, the offspring of the day. But these were no adventures, these, to my mind, welcome, long-overdue steps forward by the state toward the succor of science and its welfare, steps that help to strengthen and consolidate the organization for research by such adjuncts as the Medical Research Council and the Department of Scientific and Industrial Research. One of the strengths of this organization that has arisen is, in my view, that it interlocks with the educational system of the country. It is an organization which proceeds on the wise premise that, in the case of science, the best way to get the fruit is to cultivate the tree. It is an organization which is proving successful and economical. Its output has proved a more than liberal return on the funds at its disposal.

But essential to its continuance is continuance of adequate financial support from the government. A tripod can not stand upon two legs. The state-contribution in this country is relatively not large, but it is most important. Important as it has been in the past, it has now an importance most especially great. The cost of investigation is now higher, much higher than it has been. Endowment funds carry less far than they did carry. Private benefac-

tions and voluntary generosity, although willing, are less able to be found and less capable at this time; already gauged as inadequate of themselves alone before the war, they obviously can not alone cope with the necessary undertakings now. The present is a time when a large-scale withdrawal of the government's financial support must prove most formidably crippling. Such crippling will be greater than the actual measure of the sum withdrawn would entail in ordinary times.

To pull down under emergency what has been built up through years of careful experience and is proving efficient can scarcely be ultimate economy. It is to unlearn a useful lesson learnt. Curtailment of the state aid—relatively small in this country—given to scientific research must harm the scientific production of the country. Some curtailment, however, at this time seems unavoidable. Though extension of buildings and equipment and *personnel* is wanted, it may be necessary to withhold that extension at this time, maintaining broadly the *status quo* ready for expansion when that is once more feasible. But if research be an indispensable factor in the rebuilding of the national life, sacrifices should not be required from it disproportionately greater than from other services of a similarly essential kind. Reduction of the state's support on a scale to entail ruin to the existent organization would be a wastage rather than an economy. Calmly viewed, what more reminiscent of the wastage of the war itself than for machinery actually constructed, assembled, and producing what is needful for a nation's strength as a pillar in the industrial and intellectual temple of the world, to be now under temporary change abandoned or broken up; and at a time when industry as a whole stands convinced of scientific research as a necessity for its recovery and well-being.

My hope would be that scientific research on its present maintenance will be considered part of the intellectual bread of the community, part of the bed-rock on which rests the efficiency, not to speak of the industrial equipment, of the nation; that it will be treated as such in the measure of state-support continued to it; that the state will remember that that support has to embrace at least both the universities on

one hand, and, on the other, the research institutions administered by the state, for this reason, namely, that the country's organization for research, complex in origin, yet economical and effective, stands as an integral system to the entire existence of which is essential an adequate state provision for both these constituent elements, indispensable, since they are, to the whole structure of the system.

C. S. SHERRINGTON

HENRY MARION HOWE

IN the death of Professor Howe the world lost both a great scientist and a great teacher. There has been recorded in various places the account of his life and life work, of his honors and of his publications. When in 1917 he was presented with the John Fritz medal of the United Engineering Societies a complete record of his work as a metallurgist, as a teacher and as a writer was given, together with a list of his professional papers, of which there are over 300 titles (*Monthly Bulletin A. I. M. E.*, July, 1917, p. 30).

Henry Marion Howe died on May 14, 1922, at his residence in Bedford Hills, N. Y., after an illness of over a year. He was born at Boston, Mass., in March, 1848, the son of Dr. Samuel G. and Julia Ward Howe. His father was noted for his philanthropy and distinguished services in the Greek war for independence, while his mother, the author of the "Battle Hymn of the Republic," was a leader of many reforms, from the abolition of slavery to woman's suffrage. As Dr. Raymond at the presentation of the John Fritz medal said, "It was a good stock on both sides, making him heir to intellectual keenness and refinement, the capacity for both enthusiasm and perseverance, a passion for the pursuit of knowledge and a gift of clear and felicitous statement." For he was imbued with the spirit of scientific research, the love of investigation, a striking power of observation and of interpretation, to which was added his wonderful clearness in expressing his thoughts not alone in his writings but more especially in his lectures and in the presentation of his papers at scientific meetings.

Graduating from the Boston Latin School in